NIGHT EATING SYNDROME AND ITS ASSOCIATION WITH BODY MASS INDEX AMONG FEMALE UNIVERSITY STUDENTS

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ABSTRACT

Introduction: Night Eating Syndrome (NES) is an eating disorder which is a combination of excessive eating at night and sleep problem. This study aimed to identify prevalence of NES, its association with body mass index (BMI) and the type of foods frequently consumed at late night among female university students. **Methods**: A cross-sectional study was conducted among a total of 120 female university students from the International Islamic University Malaysia (IIUM), Kuantan using convenience sampling method. Participants were required to answer Night Eating Questionnaires (NEQ) and food consumption at late night questionnaire. **Results**: The prevalence of NES among the participants was 4.2%. The mean difference of NEQ score was significantly lower than the cut off score for NES identification (p=0.001). There was no significant association between NEQ score and BMI (p=0.606). The most preferred type of food consumed at late night was instant noodles (n=63, 52.5%), followed by chocolate (n=61, 50.8%) and biscuits with cream fillings (n=44, 36.7%). **Conclusion**: In conclusion, the prevalence of NES is relatively low and has no association with BMI among female university students. However, eating habits at late night should be of concern as unhealthy food choices could lead to unhealthy weight gain. This study provides further insight on NES specifically among female university students. Our study is at the forefront in demonstrating undesirable types of food consumed at late night in this group; which can potentially contribute to increased prevalence of obesity and non-communicable diseases.

KEYWORDS: Night eating syndrome, body mass index, eating habit, food preference, female, university students

INTRODUCTION

Night Eating Syndrome (NES) can be defined by the consumption of at least 25% or quarter of everyday calories after supper and/or waking up at night to eat (nocturnal eating) at least three times in a week (Allison and Tarves, 2011). It was discovered for the first time in 1950s but there is a debate in considering whether NES is an eating or a sleep disorder (Katzman, 2010); due to NES being a combination of excessive eating at night with sleep problem. The American Psychiatric Association recognizes NES as a disordered eating pattern and it is currently included in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) under the section ''Other Specified Feeding or Eating Disorders'' (American Psychological Association [APA], 2013). People with night eating disorder will experience eating a lot after dinner—at least quarter of their daily total calories and they eat when waking up at night and have trouble sleeping (Allison and Tarves, 2011). Furthermore, it was reported that they tend to consume food between 11 p.m. and 5 a.m. (Gluck et al., 2008).

NES is linked to poor sleep quality, stress and increased body mass index (BMI) among college students (Nolan and Geliebter, 2016). A study by Runfola et al. (2014) involving college students aged 18-26 years old revealed that students with NES had problems with their mental health, experienced more eating disorders symptoms and reduced quality of life compared to those with no NES. People with NES also experience higher psychological distress such as depression, anxiety and stress (He et al., 2018).

The NES prevalence among university students in the U.S. is 4.2% with further reduction to 2.9% after excluding students who were involved in binge eating (Runfola et al., 2014). In Malaysia, a study conducted among university students in Shah Alam showed an alarming NES prevalence of 23.4% (Sariman and Poh, 2015). Meanwhile, Gan et al. (2019) revealed the prevalence of NES among university students at a public university in Malaysia was 12.2%. Due to the nature of students who tend to stay up to complete assignments, eating at night is not something unfamiliar. A study by Choi et al. (2017) found that 46.8% of Korean adolescents engaged in night eating more than twice a week. They are more likely to choose high calorie content food which is commonly sweet, fatty and salty rather than any healthier options. Consequently, adipose tissue stores excess energy as triglycerides (Jung and Choi, 2014). Therefore, it can contribute to fat storage when eating late at night (Nicholson et al., 2018). This condition can further lead to obesity which requires attention for appropriate intervention of NES (Choi et al., 2017).

A link between BMI and NES has been identified among participants aged 31 to 60 years old, but not in those who are less than 31 or more than 60 years old (Meule et al., 2014). However, the reports on the association of NES and BMI are inconsistent. To date, no studies have been published on this topic specifically among female university students in Malaysia and the types of food they prefer to consume at late night. Therefore, this study aimed to further examine the existing gap in the body of evidence; in particular to identify the prevalence of NES, association of NES with BMI and the type of foods frequently consumed at late night among female university students.

MATERIALS AND METHODS

Participants

A cross sectional study was carried out among 120 female university students of International Islamic University Malaysia (IIUM), Kuantan aged between 19 to 24 years old. Participants were recruited through a convenience sampling. The inclusion criteria included students who were studying in Kulliyyah (Faculty) using semester system which were Kulliyyah of Allied Health Sciences, Kulliyyah of Science and Kulliyyah of Pharmacy. Those who were from Kulliyyah of Nursing, Kulliyyah of Dentistry and Kulliyyah of Medicine and diagnosed with eating disorders were excluded from this study. The students from these three Kulliyyahs were excluded to minimize the

risk of bias as they were studying using block system which includes clinical training. The difference of academic system in these faculties could contribute to higher stress level among students (Ahmad et al., 2011; Salam et al., 2013; Nasir & Abdul Maulud, 2020); which indirectly could influence unhealthy dietary pattern.

Measures

Demographic data

This section included questions on demographic data such as age, race, Kulliyyah and year of study of the participants.

Anthropometric data

Anthropometric data of participants were measured by the researcher. Body weight data was obtained by using an electronic weighing scale (SECA 803, Hamburg, Germany); whilst height was measured using portable stadiometer (SECA 213, Hamburg, Germany). BMI was calculated using the formula; weight in kilograms divided by the squared of height in meters (kg/m^2). The BMI status was classified using the WHO standard; BMI <18.5 kg/m^2 (underweight), BMI 18.5- 24.9 kg/m^2 (Normal), BMI 25- 29.9 kg/m^2 (overweight) and BMI ≥ 30 kg/m^2 (obese) (World Health Organization [WHO], 2017).

Night Eating Questionnaire (NEQ)

There are 17 items in the NEQ and each question uses the Likert scale ranging from 0-4 for scoring method (Allison et al., 2009). The scoring guide for NEQ is as detailed below:

1. Questions 1-9 were required to be answered by all participants
2. Questions 10-12 were answered only by participants who were not getting 0 score on question 9
3. Participants could skip questions 13-14 if they obtained 0 score on question 12
4. Questions 1, 4 and 14 were reverse scored
5. Questions 1-12 and 14 were summed with the exclusion of item 13 as its purpose was to screen for parasomnia
6. Question 15 was not added to the total score but was used to identify symptoms
7. Questions 16 and 17 were used to confirm the presence of distress if NES was present

A score of ≥25 indicated night eating syndrome and a score of ≥30 was a strong indicator of NES. The NEQ has been reported as an efficient and valid measure of NES severity (Leman, 2010). NEQ has an acceptable internal consistency with α=0.70 (Allison et al., 2009).

Types of food consume at late night questionnaire

A self-administered questionnaire was developed to identify the types of food that students prefer to consume after 11 p.m. Nine choices of foods were included based on common types of food consumed by late night eaters consist of sweet, salty, fatty and carbohydrate rich foods (Gallant et al., 2014); such as bread with cream filling, bread with savoury filling, bread with butter and jam, wholemeal crackers, cream crackers, biscuits with filling (chocolate, vanilla, cheese, etc.), instant noodles, chocolates, fruits, and others. For 'Others' option, the types of food were required to be stated. Participants were allowed to choose more than one type of food in the questionnaire.

Procedures

The approval for this study was granted by the IIUM Research Ethics Committee (IREC 2018-077). During data collection, participants were approached, and a set of questionnaires was given to those who voluntarily agreed to participate, provided that they fulfilled the inclusion and exclusion criteria

for this study. Prior to completing the questionnaire, the participants were given explanation about this study. An information sheet regarding the study was provided to each participant and consent forms were filled in to confirm participation.

Statistical Analysis

The collected data was analysed by using the SPSS Software Version 12.0. The sociodemographic data, prevalence of NES and frequency of food consumed were analysed using descriptive statistics. Meanwhile, the mean difference between NEQ score with cut off value was analysed using one sample t-test. The Spearman correlation analysis was run for non-parametric test to determine the correlation between BMI and NES score for not normally distributed data. Statistically significant value was set at $p<0.05$.

RESULTS

Table 1 shows that out of 120 female students, 97.5% of them were Malay (n= 117) and the remaining 2.5% (n=3) were from other races such as Dusun, Iraqi and Tidung. The age of participants ranged from 19 to 24 years old with a mean (±SD) of 21.69 ± 1.08 years old. In addition, the mean BMI was 22.99 ± 4.82 kg/m^2 while NEQ score ranged from 4 to 27 with a mean score of 15.02 ± 5.47.

Table 1: Mean Values for Age, BMI and NEQ Score of Study Participants

Characteristics	Mean ± SD	Range
Age (Year)	21.69 ± 1.08	19-24
BMI (kg/m^2)	22.99 ± 4.82	15.7-42.3
NEQ score	15.02 ± 5.47	4-27

Descriptive statistics (Table 2) were used to report the prevalence of NES among IIUM Kuantan female students. Subjects who obtained NEQ score of ≥25 were more likely to experience NES; while subjects who obtained score <25 was not considered as having risk of NES.

Table 2: Prevalence of NES among IIUM Female Students

Risk of NES	n (%)
Yes	5 (4.2)
No	115 (95.8)

One sample t-test was used to compare the mean of NEQ score with the cut off score for NES identification which was at 25. The mean score was significantly lower than the cut off score as shown in Table 3 ($p= 0.001$), which indicated low NES risk.

Table 3: Comparison of Mean NEQ Score with the Cut Off Scores

Variable	Test Value	Mean (SD) (n=120)	Mean difference (95% CI)	t-statistics (df)	*P* value
NEQ score	25	15.02 (5.47)	-9.98 (-10.97-,-9.00)	-20.01(119)	0.001*

*$p<0.05$

In this study, there was no association between NES and BMI among IIUM Kuantan female students (Table 4).

Table 4: The Association between BMI and NEQ Score

	Spearman's correlation	*P*-value
BMI and NEQ score	0.048	0.606

Figure 1 shows the types of food consumed at late night with its frequency. Most of the students preferred to eat instant noodles at late night after 11 pm which was 52.5% (n=63) followed by chocolates which was 50.8% (n=61) and the least preferred food by female students of IIUM Kuantan was bread with savoury filling which was 10.8% (n=13). Other types of food they also consumed at late night were rice (n=3, 2.5%), snack (n=3, 2.5%) followed by junk food (n=2, 1.7%); while the remaining types of food answered by the participants were: fast food, instant oat, fried rice, *keropok sira*, malt drink, milk, *nasi lemak*, bihun soup, plain wholemeal bread, salted food, soup, sweets and white bread which contributed to 0.8% each (n=1).

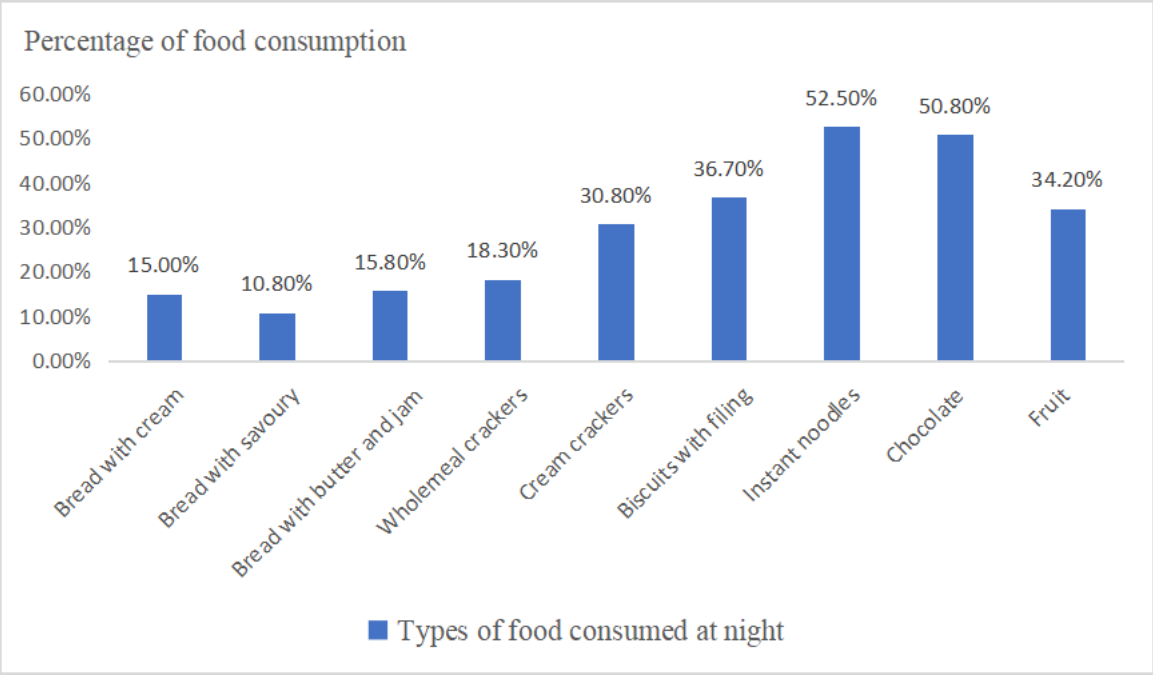

Figure 1: Types of Foods Consumed During Late Night by the Participants

DISCUSSION

The present study aimed at identifying the prevalence of NES, association of NES and BMI, as well as types of food typically consumed at late night among female university students. Our results showed that only 4.2% of the participants exhibited NES. This finding was contradictory from a previous study in Malaysia which stated that the prevalence of NES among university students in Shah Alam was 23.4% (Sariman and Poh, 2015). Another study among Malaysian university students discovered that 12.2% of them were experiencing NES (Gan et al., 2019). The results from both studies (Sariman and Poh, 2015; Gan et al., 2019) might be due to the study participants which involvedboth male and female participants, as opposed to this current study which only recruited female participants. The difference in the subjects' gender is significant as males are more prone to have NES compared to females (Sariman and Poh, 2015). This is also in parallel with the findings by Stunkard et al. (2008) whose results showed that the prevalence of NES in men was slightly higher than female. It was found that men had worse sleeping patterns and ate more during the night compared to women (Lombardo et al., 2019) and they were reported to be three times more likely to develop NES than females (Gan et al., 2019). To further support the low prevalence of NES among female students in our study, several studies highlighted that females were more aware and concerned about their body image, shape, and weight, as well as having higher self-efficacy and better nutrition quality of life

(NQoL) which measures the impact of dietary intake on quality of life (Pike and Dunne, 2015; Yun et al., 2018; Pei Lin et al., 2012).

Nonetheless, findings from other international studies on the prevalence of NES also demonstrated low prevalence with 15% among Brazilian university students (Borges et al., 2017), 9.5% among Turkish university students (Sevincer et al., 2016) and 2.4% among Chinese university students (He et al., 2018). These studies found slight inconsistencies as compared to our findings which could be due to the different socio-demographic characteristics and cultural aspects that may influence the students' eating behaviour.

On the other hand, our study showed that there was no relationship between BMI and the presence of NES. Interestingly, the mean BMI of the participants was mostly normal (67.5%) and only 9.2% were obese. This finding was in line with a study by Runfola et al. (2014) where they found no association between NES and BMI among 1636 university students. Nevertheless, other studies demonstrated that there was a positive correlation between night eating severity and BMI (Harb et al., 2012; Moizé et al., 2012). A strong, positive correlation between NES and BMI was also identified in a study among university students in Turkey by Ahmad et al. (2019). It was possible that university students faced academic challenges which in turn influenced their circadian rhythm. In an abnormal circadian rhythm, lipid and glucose metabolisms are reported to be impaired (Kanwar and Kashoo, 2011) and this could lead to the development of obesity. However, our study revealed that those who had normal BMI could as well have NES. This might be due to other factors which could prevent their weight gain such as engaging in any physical activity, but further investigation is required. Moreover, the development of obesity is multifactorial including genetics, level of physical activity and other physiological factors (Marti et al., 2004). Although the association between night eating and BMI was caused by some influences which affect thebody weight, a healthier lifestyle and less psychological distress might prevent weight gain in young adults (Meule et al., 2014).

It was found that most participants favoured salty, sweet, high in fat and calorie-dense foods at late night. The top three most preferred food that the participants chose to eat at late night were instant noodles, chocolates and biscuit with fillings. A study conducted involving medical students in Malaysian university revealed that majority of the respondents opted for these types of food because of the nice taste even though they were aware that the foods contained high calories (Mar Mar et al., 2018). Many people tend to consume more highly palatable items such as sweet and salty foods, which are usually more caloric dense when they are exhausted and had restrained themselves all day (Allen, 2015). Night-eaters prefer foods that are high in fat, sweet and salty which they do not consume earlier in the day (Aronoff et al., 2001). In addition, the first factor that students would consider for food purchasing is the cost of food (Izwan Syafiq et al., 2019). From the psychophysiological aspect, people usually opt to consume sweet foods because of the enjoyment of having something sweet—whose process facilitats at the same time by morphine-like feeling which signals the sweet food consumption as a highly rewarding activity (Goldstein, 2015).

The limitation of the study is the use of convenience sampling and only university students from IIUM Kuantan were recruited as study participants. Meanwhile, the exclusion of students from Kulliyyah of Nursing, Dentistry and Medicine might result in lower prevalence. Thus, future study is needed in this group for significant comparison; while a larger scale study involving public and private university students is recommended. Identified strength of this study is the reporting on types of food consumed at late night which has never been examined particularly among female university students in Malaysia.

CONCLUSION

In conclusion, the prevalence of NES among female university students is low. There is no significant correlation found between BMI and NES. The participants prefer to eat foods that are sweet, salty, high in fat and calories at night. NES can be a major concern to the world as it can further lead to overweight and obesity. Thus, programmes related to nutritional awareness on adverse effects of NES should be planned and implemented accordingly. For future research, portion of foods taken

and comparison between gender need to be investigated. This study provides further insight into the body of knowledge on NES especially among young female adults.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

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